CLAIMS

1. A method of operating a satellite communications system comprising an earth station arranged selectively to communicate with a plurality of mobile satellite terminals via a satellite, the method comprising, at the earth station:

storing messages each addressed to one or more of said terminals,

transmitting, in a time-division multiplexed frequency channel, data packets and signalling information addressed to said terminals,

receiving, in one or more signalling channels determined by said signalling channel information, time-divided signals transmitted by said terminals,

transmitting, in one or more to-mobile messaging channels, message packets addressed to said terminals, and

receiving, in one or more from-mobile messaging channels, message packets transmitted by said terminals,

wherein each of said messages stored at said earth station is selectively transmitted as said data packets or said message packets.

2. A method as claimed in claim 1, wherein, in a connection-oriented mode, the earth station transmits a to-mobile call set-up signal addressed to a selected said terminal and receives a from-mobile call set-up signal from said selected terminal, and subsequently the earth station transmits one or more said messages to said selected terminal on said to-mobile message channel;

and, in a connectionless mode, the earth station transmits one or more messages to a selected said terminal on said time-division multiplexed channel without said steps of transmitting said to-mobile call set-up signal and receiving said from-mobile call set-up signal.

3. A method as claimed in claim 1 or 2, wherein said one or more to-mobile messaging channels are transmitted to said satellite so as to be retransmitted by said satellite in one or more spot beams generated by said satellite.

4. A method as claimed in any preceding claim, wherein each of said messages is selectively transmitted as said data packets or said message packets dependent on the length of said message.

5. A method of operating a satellite communications system comprising an earth station arranged selectively to communicate with a plurality of mobile satellite terminals via a satellite, the method comprising, at one of said mobile terminals:

receiving, from said earth station in a time-division multiplexed frequency channel, a plurality of data packets including one or more data packets addressed to said one of said mobile terminals and signalling channel information.

transmitting to said earth station in one or more signalling channels selected according to said signalling channel information, data packets addressed to said earth station.

receiving from said earth station, in one or more to-mobile messaging channels, one or more message packets addressed to said one of said mobile terminals, and

transmitting to said earth station, in one or more from-mobile messaging channels, one or more message packets,

wherein each message received from said earth station by said one of said mobile terminals is received either in said time-division multiplexed channel or in said to-mobile message channel.

6. A method as claimed in claim 5, wherein, in a connection-oriented mode, said one of the terminals transmits a from-mobile call set-up signal to said earth station and receives a to-mobile call set-up signal from said earth station, and subsequently receives one or more messages from said earth station on said to-mobile messaging channel, and, in a connectionless mode, receives one or more messages from said earth station on said time division multiplexed channel without the steps of receiving said to-mobile call set-up signal and transmitting said from-mobile call set-up signal.

7. A satellite messaging terminal, comprising:

a receiver selectively tunable to receive a time division multiplexed frequency channel or one of a plurality of to-mobile messaging channels:

a transmitter selectively tunable to transmit in one of a plurality of signalling channels or one of a plurality of from-mobile messaging channels in response to information received in said time-division multiplexed frequency channel; and

means for decoding and storing data packets received in both said time-division multiplexed frequency channel and said plurality of to-mobile message channels.

8. A method of transmitting messages of variable length from a first earth station via satellite to a second earth station, the method comprising, for each said message:

formatting the data content of said message to generate one or more data packets of constant length, each data packet comprising packet information and data.

determining an integral number of data packets per frame and an integral number of frames according to the number of said data packets and a maximum value of said number of data packets per frame, such that the product of said number of packets per frame and said number of frames is equal to the total number of data packets or greater than the total number of data packets by a minimum number.

formatting said data packets into said number of frames, each of said frames having no more than said number of packets per frame;

encoding each said frame independently of the other said frames; and

transmitting said encoded frames from the first earth station to the second earth station.

9. A method as claimed in claim 8, wherein the data capacity of each of said data packets is 32 bytes.

10. A method as claimed in claim 8 or claim 9, wherein the maximum value of said number of packets per frame is 16 packets.

11. A method of exchanging messages between a satellite earth station and a mobile terminal, comprising:

performing the method of any one of claims 8 to 10, wherein said first earth station comprises said satellite earth station and said second earth station comprises said mobile terminal; and

performing the method of any one of claims 8 to 10, wherein said first earth station comprises said mobile terminal and said second earth station comprises said satellite earth station.

12. A mobile satellite communications terminal, comprising:

an input device for inputting a message;

a formatter for formatting said message to generate one or more data packets of constant length, each data packet comprising packet information and data, for determining an integral number of packets per frame and an integral number of frames according to the number of data packets and a maximum value of said frame length, such that the product of said number of packets per frame and said number of frames is equal to the total number of data packets or greater than the total number of data packets by a minimum number, and for formatting the data packets into said number of frames, each having no more than said number of packets per frame.

an encoder for encoding each of said frames independently of the other said frames, and

a transmitter for transmitting said encoded frames to a satellite.

13. A terminal as claimed in claim 12, wherein the data capacity of each of said packets is 32 bytes.

14. A terminal as claimed in claim 12 or 13, wherein the maximum value of said frame length is 16 packets.

15. A method of transmitting information from a mobile satellite communications terminal to a satellite earth station via a satellite, comprising:

receiving from said satellite earth station signalling channel information indicating a frequency channel, a frame division and a timing reference signal;

selecting one of a long slot length and a short slot length:

determining a random or pseudo-random slot allocation: and

transmitting said information in said frequency channel with a timing determined according to the timing reference signal, said frame division, the selected slot length and the slot allocation, such that the information is transmitted within a selected time slot within a frame synchronized with said timing reference signal and comprising a successive plurality of short time slots and a successive plurality of long time slots, the respective numbers of said long and short time slots being defined by said frame division, the information being transmitted either in one of said long time slots or in one of said short time slots according to the selection of a long slot length or a short slot length respectively, the individual one of said slots being determined by said slot allocation.

16. A method of receiving information from a plurality of mobile satellite communications terminals at a satellite earth station via satellite, comprising:

transmitting to said terminals a timing reference signal and signalling channel information indicating a frequency channel and a frame division: and

receiving said information from said terminals in said frequency channel in a format comprising a frame consisting of a successive plurality of long time slots and a successive plurality of short time slots, the respective number of said short and long time slots being dependent on said frame division, each of said slots containing a burst transmitted by one or more of said terminals.

17. A method of operating a mobile communications system comprising an earth station, a network coordination station, and a plurality of mobile terminals each able to communicate with said earth station and network coordination station via a satellite, the method comprising:

storing at said earth station information identifying a registered group of said mobile terminals;

storing a message including address information indicating a selected one of said mobile terminals:

determining whether said selected mobile terminal is one of said registered group of mobile terminals;

and, if said selected mobile terminal is not one of said registered group, sending a first message indication from said earth station to said network coordination station, said first message indication including an identity code identifying said selected mobile terminal;

and, if said selected mobile terminal is one of said registered group, transmitting a second message indication from said earth station to said selected mobile terminal.

18. A method as claimed in claim 17, wherein, if said selected mobile terminal is one of said registered group, said second message indication comprises said message.

19. A method as claimed in claim 17, wherein, if said selected mobile terminal is one of said registered group, in response to said second message indication, said selected mobile terminal receives a message channel transmitted by said earth station, and said first earth station transmits said message to said selected mobile terminal on said message channel.

20. A method as claimed in claim 17, further comprising, if said selected mobile terminals is not one of said registered group,

transmitting a channel command from said network coordination station to said selected mobile terminal,

at the selected mobile terminal, in response to said channel command, receiving a channel transmitted by said earth station.

21. A method as claimed in claim 20, further comprising transmitting said message from said first earth station in said channel.

22. A method as claimed in claim 20, further comprising transmitting a message channel indication from said first earth station in said channel:

receiving a message channel at the selected mobile terminal, in response to said message channel indication; and

at the earth station, transmitting said message in said message channel.

23. A method of operating a mobile communications system comprising an earth station, and a plurality of mobile terminals able to communicate with said earth station via a satellite, the method comprising:

transmitting from said earth station first and second continuous channels each indicating corresponding first and second frequency channels,

receiving in said first frequency channel a log-in request from one of said mobile terminals:

selectively transmitting to said one mobile terminal in said first continuous channel in response to said log-in request either an acknowledgement signal, such that the one mobile terminal remains tuned to receive said first continuous channel, or a channel change indication, such that the one mobile terminal tunes to receive said second continuous channel.

24. A method of operating an satellite earth station, comprising:

in a first mode, transmitting via a satellite a single channel containing information identifying one or more frequency channels, and receiving signals from one or more mobile terminals in said frequency channels;

in a second mode, receiving signals from said one or more mobile terminals via said satellite and via a remote satellite earth station;

and, in a third mode, transmitting via said satellite a plurality of channels each containing information identifying a respective one or more frequency channels, and receiving signals from groups of said mobile terminals in the respective frequency channels corresponding to the transmitted channels to which the groups of said mobile terminals are tuned.

25. A method of allocating respective transmission frequencies to a plurality of mobile terminals in a satellite communications system, comprising:

transmitting to a first group of mobile terminals a first common frequency channel containing first frequency channel information allocating a first group of successive frequency channels to said first group of mobile terminals; and

transmitting to a second group of mobile terminals a second common frequency channel containing second frequency channel information allocating a second group of successive frequency channels to said second group of mobile terminals;

wherein the minimum channel spacing between frequency channels within either of said first and second channel groups is less than the minimum channel spacing between any frequency channel of said first group and any frequency channel of said second group.

26. A method as claimed in claim 25, wherein said minimum channel spacing within each said group is 1.25 or 2.5 kHz.

27. A method as claimed in claim 25 or 26, wherein said minimum channel spacing between channels of said first and second group is 3.75 or 5 kHz.

28. A method of communication between a mobile terminal and a satellite earth station via a repeating satellite, comprising:

transmitting signals from said satellite earth station to said mobile terminal using a BPSK modulation scheme; and

receiving signals at said satellite earth station from said mobile terminal modulated using a $\pi/2$ BPSK modulation scheme.

29. A method of addressing a plurality of mobile terminals in a satellite earth station arranged to communicate with said mobile terminals via a satellite, comprising:

storing a plurality of arrays each containing a list of addresses of a group of said mobile terminals;

receiving a group identity code and a group index code;

selecting one of said arrays according to said group identity code and selecting one of the addresses within said selected array according to said group index code, and

transmitting said selected address so as to be receivable by a selected one of the mobile terminals corresponding to said address; wherein the method further comprises:

receiving a message from one of said mobile terminals; and modifying the list of addresses of at least one of said arrays in response to said message.

30. A method of operating a messaging terminal for receiving messages from an earth station via a satellite, the method comprising:

transmitting to the earth station a sleep mode request;

receiving from the earth station a sleep mode allocation;

periodically entering a receiving state during which the messaging terminal is able to receive messages for a first period specified by said sleep mode allocation; and

periodically entering a non-receiving state during which the messaging terminal is not able to receive messages for a second period specified by said sleep mode allocation.

31. A method of operating an earth station for transmitting messages via a satellite to a messaging terminal, comprising:

receiving a sleep mode request from the mobile terminal;

in response to said request, transmitting a sleep mode allocation to said messaging terminal;

transmitting messages to said terminal within a repeating first period corresponding to said sleep mode allocation; and

inhibiting the transmission of messages to said terminal within a repeating second period corresponding to said sleep mode allocation.